



DO-IT

Universal Design: Process, Principles, and Applications

A goal and a process that can be applied to the design of any product or environment
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Designing any product or environment involves the consideration of many factors, including aesthetics, engineering options, environmental issues, safety concerns, industry standards, and cost. Typically, designers consider the average user. In contrast, universal design (UD), according to the Center for Universal Design, “is the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design” (http://www.design.ncsu.edu/cud/about_ud/about_ud.htm).

When UD principles are applied, products and environments meet the needs of potential users with a wide variety of characteristics. Disability is just one of many characteristics that an individual might possess. For example, one person could be Hispanic, six feet tall, male, thirty years old, an excellent reader, primarily a visual learner, and deaf. All of these characteristics, including his deafness, should be considered when developing a product or environment he, as well as individuals with many other characteristics, might use.

UD can be applied to any product or environment. For example, a typical service counter in a place of business is not accessible to everyone, including those of short stature, those who use wheelchairs, and those who cannot stand for extended periods of time. Applying UD principles might result in the design of a counter that has multiple heights—the standard height designed for individuals within the average range of height and who use the counter while standing up and a shorter height for those who are shorter than average, use a wheelchair for mobility, or prefer to interact with service staff from a seated position.

Making a product or an environment accessible to people with disabilities often benefits others. For example, automatic door openers benefit individuals using walkers and wheelchairs, but also benefit people carrying groceries and holding babies, as well as elderly citizens. Sidewalk curb cuts, designed to make sidewalks and streets accessible to those using wheelchairs, are often used by kids on skateboards, parents with baby strollers, and delivery staff with carts. When television displays in airports and restaurants are captioned, programming is accessible not only to people who are deaf but also to others who cannot hear the audio in noisy areas.

UD is a goal that puts a high value on both diversity and inclusiveness. It is also a process. The following paragraphs summarize process, principles, and applications of UD.

The Process of Universal Design

The process of UD requires a macro view of the application being considered as well as a micro view of subparts of the application. UD can be applied to a variety of applications. The following list suggests a process that can be used to apply UD:

1. *Identify the application.* Specify the product or environment to which you wish to apply universal design.
2. *Define the universe.* Describe the overall population (e.g., users of service), and then describe the diverse characteristics of potential members of the population for which the application is designed (e.g., students, faculty, and staff with diverse characteristics with respect to gender; age; size; ethnicity and race; native language; learning style; and abilities to see, hear, manipulate objects, read, and communicate).



3. *Involve consumers.* Consider and involve people with diverse characteristics (as identified in Step 2) in all phases of the development, implementation, and evaluation of the application. Also gain perspectives through diversity programs, such as the campus disability services office.
4. *Adopt guidelines or standards.* Create or select existing universal design guidelines/standards. Integrate them with other best practices within the field of the specific application.
5. *Apply guidelines or standards.* Apply universal design in concert with best practices within the field, as identified in Step 4, to the overall design of the application, all subcomponents of the application, and all ongoing operations (e.g., procurement processes, staff training) to maximize the benefit of the application to individuals with the wide variety of characteristics identified in Step 2.
6. *Plan for accommodations.* Develop processes to address accommodation requests (e.g., purchase of assistive technology, arrangement for sign language interpreters) from individuals for whom the design of the application does not automatically provide access.
7. *Train and support.* Tailor and deliver ongoing training and support to stakeholders (e.g., instructors, computer support staff, procurement officers, volunteers). Share institutional goals with respect to diversity and inclusion and practices for ensuring welcoming, accessible, and inclusive experiences for everyone.
8. *Evaluate.* Include universal design measures in periodic evaluations of the application, evaluate the application with a diverse group of users, and make modifications

based on feedback. Provide ways to collect input from users (e.g., through online and printed instruments and communications with staff).

Universal Design Principles

At the Center for Universal Design (CUD) at North Carolina State University a group of architects, product designers, engineers, and environmental design researchers established seven principles of UD to provide guidance in the design of products and environments. Following are the CUD principles of UD, each followed with an example of its application:

1. *Equitable use.* The design is useful and marketable to people with diverse abilities. For example, a website that is designed to be accessible to everyone, including people who are blind, employs this principle.
2. *Flexibility in use.* The design accommodates a wide range of individual preferences and abilities. An example is a museum that allows visitors to choose to read or listen to the description of the contents of a display case.
3. *Simple and intuitive.* Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level. Science lab equipment with clear and intuitive control buttons is an example of an application of this principle.
4. *Perceptible information.* The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities. An example of this principle is captioned television programming projected in noisy restaurants.
5. *Tolerance for error.* The design minimizes hazards and the adverse consequences



of accidental or unintended actions. An example of a product applying this principle is software applications that provide guidance when the user makes an inappropriate selection.

6. *Low physical effort.* The design can be used efficiently, comfortably, and with a minimum of fatigue. Doors that open automatically for people with a wide variety of physical characteristics demonstrate the application of this principle.
7. *Size and space for approach and use.* Appropriate size and space is provided for approach, reach, manipulation, and use regardless of the user's body size, posture, or mobility. A flexible work area designed for use by employees with a variety of physical characteristics and abilities is an example of applying this principle.

Applications of Universal Design

UD can be applied to any product or environment, such as curriculum, instruction, career services offices, multimedia, tutoring and learning centers, conference exhibits, museums, microwave ovens, computer labs, worksites, and web pages. DO-IT (Disabilities, Opportunities, Internetworking, and Technology) produces publications and video presentations that promote UD in a variety of environments.

Listed below are some of DO-IT's resources. Videos can be viewed freely online or purchased from DO-IT. Publications are provided in an accessible and camera-ready format and may be duplicated for presentations, mailings, and other noncommercial purposes. You may link to the resources in the following list by selecting "Publications and Videos" at <http://www.washington.edu/doit/>.

Universal Design of Computer Labs

Equal Access: Universal Design of Computer Labs

Universal Design of Distance Learning

Equal Access: Universal Design of Distance Learning

Real Connections: Making Distance Learning Accessible to Everyone

Universal Design in Education

Equal Access: Universal Design of Instruction

Universal Design in Education: Principles and Applications

Universal Design of Instruction: Definition, Principles, and Examples

Universal Design of Libraries

Equal Access: Universal Design of Libraries

Universal Design of Physical Spaces

Equal Access: Universal Design of Physical Spaces

Universal Design of Professional Organizations, Projects, Conference Exhibits, and Presentations

Equal Access: Universal Design of Conference Exhibits and Presentations

Equal Access: Universal Design of Professional Organizations

Equal Access: Universal Design of Your Project

Universal Design of Software

Designing Software that is Accessible to Individuals with Disabilities

Universal Design of Student Services

Equal Access: Universal Design of Advising

Equal Access: Universal Design of Career Services

Equal Access: Universal Design of Computer Labs

Equal Access: Universal Design of Financial Aid

Equal Access: Universal Design of Housing and Residential Life

Equal Access: Universal Design of Libraries

Equal Access: Universal Design of Recruitment and Undergraduate Admissions

Equal Access: Universal Design of Registration

Equal Access: Universal Design of Student Services



*Equal Access: Universal Design of Student Organizations
Equal Access: Universal Design of Tutoring and Learning Centers*

Universal Design of Technology in the Workplace

Access to Technology in the Workplace: In Our Own Words

Universal Design of Telecommunications Products

Use of Telecommunications Products by People with Disabilities

Universal Design as a Topic of Instruction

Universal Design of Web Pages in Class Projects

Universal Design of Video and Multimedia

Creating Video and Multimedia Products that are Accessible to People with Sensory Impairments

Universal Design of Websites

*Universal Design of Web Pages in Class Projects
World Wide Access: Accessible Web Design*

Resources

AccessIT (National Center on Accessible Information Technology in Education)
<http://www.washington.edu/accessit/>

AccessSTEM (Alliance for Students with Disabilities in Science, Technology, Engineering and Mathematics)
<http://www.washington.edu/doit/Stem/>

Applications of Universal Design
<http://www.washington.edu/doit/Resources/udesign.html>

Center for Applied Special Technology (CAST)
<http://www.cast.org/udl/>

Center for Universal Design
<http://www.design.ncsu.edu/cud/>

Center for Universal Design in Education
<http://www.washington.edu/doit/CUDE/>

Trace Center
<http://www.trace.wisc.edu/>

About DO-IT

DO-IT (Disabilities, Opportunities, Internetworking, and Technology) serves to increase the successful participation of individuals with disabilities in challenging academic programs such as those in science, engineering, mathematics, and technology. Primary funding for DO-IT is provided by the National Science Foundation, the State of Washington, and the U.S. Department of Education. This material is based upon work supported by the National Science Foundation under cooperative agreement No. HRD-0227995. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of the National Science Foundation (NSF). For further information, to be placed on the DO-IT mailing list, or to request materials in an alternative format, contact:

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